

LK7418-LAS

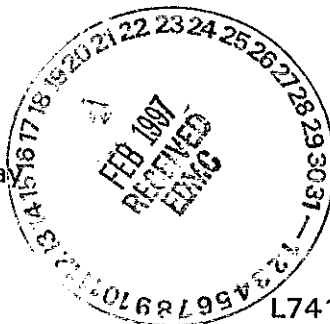
Lockheed Environmental Systems & Technologies Co.  
Lockheed Analytical Services  
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705  
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

0046719

LOCKHEED MARTIN

July 23, 1996

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
3350 George Washington Way  
MS B1-35  
Richland, WA 99352



RE: Log-in No.:	L7418
Quotation No.:	Q400000-B
SAF:	B96-147
Document File No.:	0713596A
WHC Document Control No.:	386
SDG No.:	LK7418



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on July 13, 1996. The temperature of the cooler upon receipt was 5°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Sincerely,

*Kathleen M. Hall*  
Kathleen M. Hall  
Client Services Representative

cc: Client Services  
Document Control

000003

## **CASE NARRATIVE RADIOCHEMICAL ANALYSES**

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, and duplicate samples.

**NOTE:** Chemical recoveries and minimum detectable activities can be found on the preparation sheets and calculation sheets of the attached raw data.

### **Holding Time Requirements**

All holding time requirements were met.

### **Analytical Method Strontium-90**

The strontium-90 analysis was performed using standard operating procedure, LAL-91-SOP-0065. The samples were analyzed in workgroup 38962. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample recovery was within QC criteria. The duplicate recoveries were within QC criteria. The minimum detectable activity for sample BOHX08 (L7418-2) was greater than the reporting detection limit; since all QC criteria were met data quality is not believed to be adversely affected. No re-analyses were performed.

Andrea Tippet  
Prepared By

June 23, 1996  
Date

**000004**

**Lockheed Analytical Services**  
**DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES**

[Revised 04/05/96]

<b>For Use on the Analytical Data Reporting Forms</b>	
<b>B</b>	Any constituent that was detected in the associated method blank at a concentration was greater than the reporting detection limit (RDL).
<b>C</b>	The minimum detectable activity exceeded the RDL due to the residue weight limitations forcing a volume reduction.
<b>D</b>	Constituent detected in the diluted sample.
<b>E</b>	Constituent concentration exceeded the calibration or attenuation curve range.
<b>F</b>	<i>For Alpha Spectrometry Only</i> -- Full width half max exceeded the acceptance limits.
<b>H</b>	Sample analysis performed outside of method-specified maximum holding time requirement.
<b>Y</b>	Chemical yield exceeded acceptance limits.
<b>For Use on the QC Data Reporting Forms</b>	
<b>*</b>	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
<b>a<sup>1</sup></b>	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
<b>b<sup>1</sup></b>	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

<sup>1</sup> Used as foot note designations on the QC summary form.

**000005**

LOCKHEED ANALYTICAL SERVICES  
LOGIN CHAIN OF CUSTODY REPORT (ln01)  
Jul 15 1996, 08:46 am

Login Number: L7418  
Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L7418-1 TEMP 5 Location: 157 Water 1 S SCREENING	BOHXQ8	10-JUL-96	13-JUL-96	28-JUL-96
Hold:06-JAN-97				
* L7418-2 TEMP 5 Location: 157 Water 1 S SR-TOTAL LAL-0065	BOHXQ8	10-JUL-96	13-JUL-96	28-JUL-96
L7418-3 TEMP 5 Location: 157	BOHXQ8	10-JUL-96	13-JUL-96	28-JUL-96
L7418-4 TEMP 5 Location: 157	BOHXQ8	10-JUL-96	13-JUL-96	28-JUL-96
L7418-5 TEMP 5 Location: 157	BOHXQ8	10-JUL-96	13-JUL-96	28-JUL-96
* L7418-6 Location: Water 1 S EDD - DISK DEL. Water 1 S RAD RPT TYPE 2	REPORT TYPE	13-JUL-96	13-JUL-96	28-JUL-96

000007

\* analysis and report type  
changed

Page 1

Signature:                     

Date:                     

0713596t

<b>Bechtel Hanford Inc.</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>				L7418		B96-147-19		Page 1 of 1		
Collector <i>A. Rizzo</i>		Company Contact J. V. Borghese		Telephone No. (509) 373-4790		<input type="checkbox"/> Priority <input type="checkbox"/> Normal						
Project Designation 100-NR-2 Pump and Treat Treatability Study		Sampling Location 100 N		SAF No. B96-147								
Ice Chest No. <i>GWS-025</i>		Field Logbook No. <i>EE-1288</i>		Method of Shipment Federal Express								
Shipped To Lockheed		Offsite Property No. <i>W96-0-0314-2</i>		Bill of Lading/Air Bill No. <i>2904659773</i>								
POSSIBLE SAMPLE HAZARDS/REMARKS		Preservation	HNO3 to pH <2	None								
		Type of Container	G/P	G/P								
		No. of Container(s)	4	1								
Special Handling and/or Storage Maintain samples between 2 degrees C and 6 degrees C.		Volume	1000ml	20ml								
SAMPLE ANALYSIS		Strontium-89,90 - Total Sr	Activity Scan									
Sample No.	Matrix *	Sample Date	Sample Time									
B0HXQ8	Water	<i>7/10/96</i>	<i>0930</i>	<i>X</i>	<i>X</i>							
CHAIN OF POSSESSION		Sign/Print Names										
		Relinquished By	Date/Time	Relinquished By	Date/Time	SPECIAL INSTRUCTIONS						
		<i>A.G. Rizzo (EOD)</i>	<i>7-10-96</i>	<i>Bill White</i>	<i>1341/14h-7-10-96</i>							
		Relinquished By	Date/Time	Relinquished By	Date/Time							
		<i>Bill White</i>	<i>7-12-96</i>									
Relinquished By	Date/Time	Relinquished By	Date/Time									
LABORATORY SECTION		Received By	Title		Date/Time							
		<i>Paul C. Jones</i>	<i>Sample Custodian</i>		<i>7-13-96/0930</i>							
FINAL SAMPLE		Disposal Method	Disposed By		Date/Time							

Matrix \*

- S - Soil
- SE - Sediment
- SO - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- DS - Drums Solids
- DL - Drums Liquids
- T - Tissue
- WI - Wipe
- L - Liquid
- V - Vegetation
- X - Other

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## SAMPLE CHECK-IN LIST

Date/Time Received: 7-13-96 / 9:30 am

SDG#: 1118

Work Order Number: 1118

SAF #: B96-147

Shipping Container ID: GWS-025 Chain of Custody #: 1118

1. Custody Seals on shipping container intact? Yes ☒ No ☐
2. Custody Seals dated and signed? Yes ☒ No ☐
3. Sample temperature 5°C
4. Vermiculite/packing materials is Wet ☐ Dry ☒
5. Each sample is in a plastic bag? Yes ☒ No ☐
6. Sample holding times exceeded? Yes ☐ No ☒

7. Samples have:  
✓ tape        hazard labels  
✓ custody seals        appropriate sample labels

8. Samples are:  
✓ in good condition        leaking  
       broken        have air bubbles

9. Is the information on the COC and Sample bottles in agreement?

Yes ☒ No ☐

Notes: \_\_\_\_\_

Sample Custodian/Laboratory: Paula D. Smith / LAS Date: 7-13-96

Telephoned To: KATHLEEN HALL On 7-13-96 By Paula D. Smith

ACS 7-13-96

# LOCKHEED MARTIN

## Sample Login Login Review Checklist

Lot Number 67415

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports from the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

### SAMPLE SUMMARY REPORT

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all sample ID's correct?	<u>X</u>	—	—	_____
2. Are all samples present?	<u>X</u>	—	—	_____
3. Are all matrices indicated correctly?	<u>X</u>	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	<u>X</u>	—	—	_____
5. Are all analyses logged in for the correct container?	<u>X</u>	—	—	_____
6. Are samples logged in according to LAS batching procedures?	<u>X</u>	—	—	_____

### LOGIN CHAIN OF CUSTODY

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are the collect, receive, and due dates correct for every sample?	<u>X</u>	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	<u>X</u>	—	—	_____

### SAMPLE RECEIVING CHECKLIST

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	<u>X</u>	_____

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Paul D. Jones  
primary review signature

7-12-96  
date

Paul D. Jones  
secondary review signature

7-12-96  
date

0713596

# Lockheed Analytical Services

## Sample Receiving Checklist

Page | of |

Client Name: *BECTHEL - HUNT*

Job No. *67418*

Cooler ID: *17112*

### COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *58*

temperature of temp. blank upon receipt:

	Yes	No	* Comments/Discrepancies
custody seals intact	<i>X</i>		
chain of custody present	<i>X</i>		
blue ice (or equiv.) present/frozen	<i>X</i>		
rad survey completed	<i>X</i>		

### SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	<i>X</i>		
samples intact	<i>X</i>		
proper container used for sample type	<i>X</i>		
sample volume sufficient for analysis	<i>X</i>		
proper pres. indicated on the COC	<i>X</i>		
VOA's contain headspace			<i>not</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>not</i>

### MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		<i>X</i>	
samples to subcontract		<i>not</i>	

### ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *Paul W. Ceno 7-13-96*

Sent to the client (date/initials):

\*\* Client's signature upon receipt:

Notes: \* = contact the appropriate CSR of any discrepancies immediately upon receipt

\*\* = please review this information and return via facsimile to the appropriate CSR (702) 361-8146

07135961



# LOCKHEED ANALYTICAL SERVICES

## RADIOCHEMISTRY DATA REPORT

Account Name: Bechtel Hanford, Inc. \* Richland, WA

Project Name: BECHTEL-HANFORD

Project Desc: Bechtel Hanford Project

Client Sample ID: BOHXQ8

Date Collected: 10-JUL-96

Matrix: Water

Login Number: L7418

Date Received: 13-JUL-96

Constituent	Method	Batch	Activity	Error	MCA	Qualifier	Units	Analyzed	Lab ID
Sr-89,90	LAL-0065	38962	0.28	0.68	1.2		pCi/L	19-JUL-96	L7418-2

# LOCKHEED ANALYTICAL LABORATORY

## SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS TOTAL RADIOSTRONTIUM - LAL-91-SOP-0065

Date Prep Started : 7/18/96  
WorkGroup : SR-TOTAL LAL-0065 38962

Matrix : Water  
Prep Due Date : 07/24/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQOT VOLUME (g or L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7418-2	38962DUP1	1	DUP1	38962-01	.5	2	7/19/96	15:45	8.7257				
Lab Ctrl Sample	38962LCS1	2	LCS1	38962-02	↓	↓	↓	↓	8.7026				
Method Blank	38962MBB	3	MBB1	38962-03	↓	↓	↓	↓	8.6709				
BOHX08	L7418-2	4	SMP1	38962-04	↓	↓	↓	↓	8.6812				
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											
Conc&Vol of Carrier	2mL; 10mg/mL	val: 0425			Act & Vol of LCS		1mL 40 pCi/mL				Prep Anlst		M. YOUNG
Carrier Exp Date	4/29/97				LCS Ref Date		8/1/96				Start Date		7/18/96
Carrier ID#	94-0658-35				LCS ID#		95-721-33-1				Count Anlst		

Balance Number : \_\_\_\_\_ ( )  
\_\_\_\_\_ ( )

Pipette Number : 115387 (✓)  
\_\_\_\_\_ ( )

Carrier and LCS added by: MY  
Witnessed by: 7/18/96

Comments :

Analyst : WMA/7/19/96

Checked by : QH

Cnt Rm Custody\Date : 8V 7-22-96

V98024

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# LOCKHEED ANALYTICAL LABORATORY

## SAMPLE PREPARATION LOG FOR STRONTIUM ANALYSIS TOTAL RADIOSTRONTIUM - LAL-91-SOP-0065

Date Prep Started : 7/18/96

Matrix : Water

WorkGroup : SR-TOTAL LAL-0065 38962

Prep Due Date : 07/24/96

CUSTOMER ID	PARENT LAL ID	NO	QC	CHILD LAL ID	ALIQVOT VOLUME (L)	SR CARRIER (mL)	YTTRIUM SEP DATE	YTTRIUM SEP TIME	PLANCHET TARE WT (grams)	PLANCHET GROSS WT (grams)	* * *	RESIDUE WEIGHT (grams)	COMMENTS
L7418-2	38962DUP1	1	DUP1	38962-01	7.5	2	7/19/96	15:45	8.7257	8.7637		0.038	
Lab Ctrl Sample	38962LCS1	2	LCS1	38962-02	1	2	7/19/96	15:45	8.7026	8.7385		0.0359	
Method Blank	38962MBB	3	MBB1	38962-03	1	2	7/19/96	15:45	8.6709	8.708		0.0371	
BOHXO8	L7418-2	4	SMP1	38962-04	3V 1.5	2	7/19/96	15:45	8.6812	8.7099		0.0287	
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											
Conc&Vol of Carrier	21.25 mg/mL; 2.0 mL				Act & Vol of LCS		40.00 pCi/mL; 1.0 mL				Prep Anlst		my
Carrier Exp Date	29-Apr-97				LCS Ref Date		01-Aug-90				Start Date		7/18/96
Carrier ID#	94-658-35				LCS ID#		95-721-33				Count Anlst		lv

Balance Number : ( )

Pipette Number : 115387 ( )

Carrier and LCS added by: my

Witnessed by : nn

Comments :

Analyst : W. L. Ch. 7/18/96 Checked by : Q. H.

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V86024



CERT #	Calibration	Expiration	Reference	VENDOR	PREP	WITNESSES
Parent Rad #	CERT date	Date	#		INITIALS	INITIALS
SRM #	1000	10-2-93	SRM #4919-6-A	NIST		
4919-6	AUG 1, 1990		91-0199-63			
ITEM #	Preparation	Final	INITIAL			
	DATE	Concentration	Concentration			
✓	10-2-91 1000 EST P. 11/84 AUG 1, 1990	12-1-91 6000.685 Bq/g	4.514 X 10 <sup>3</sup> Bq/g			

9/10/91

Radioisotope = SR-90

SOURCE # 4919-6

SOURCE description # Solution in NIST Borosilicate glass ampule

Composition # SR-90 + Y-90 plus approximately 95 mg of non radioactive Sr and yttrium per gram of 1 molar HCL

mass approximately 5.0 grams

Radioactivity conc 4.514 X 10<sup>3</sup> Bq/g

Reference time = 1000 EST Aug. 1, 1990

T<sub>1/2</sub> = 28.5 to 2 years

10/2/91 Preparation

1/ weighing

100.0 ml V.F. + Standard of SR-90 in ampule

= 65.2000

100.0 ml V.F. (empty) (g) = 60.2814

DIFFERENCE or mass (g) +ve = 4.9186

2/ Calculations =

$$4.514 \times 10^3 \text{ Bq/g} \times 4.9186 = 22,202.5604 \text{ Bq}$$

$$22,202.5604 \text{ Bq} \times 0.7027 \text{ Bq/Bq} = 6000.685979 \text{ Bq}$$

(STD date Aug 1, 1990) Continued on Page

Transferred 11-19-91 Paul Felt

(Received from LAL 106 0199 pg 63)  
Read and Understood By

000027

Joe  
Signature

11/19/91  
Date

[Signature]  
Signature

12/1/91  
Date



THIS IS A PHOTOCOPY OF THE CERTIFICATE  
WHICH IS BEING MAILED TO YOU UNDER  
SEPARATE COVER.

## National Institute of Standards & Technology

# Certificate

### Standard Reference Material 4919-G Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule <sup>(1)*</sup>
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 $\mu$ g each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid <sup>(2)</sup>
Mass	Approximately 5.0 grams
Radioactivity concentration	$4.514 \times 10^5$ Bq g <sup>-1</sup>
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(4)</sup>
Alpha-particle-emitting impurities	None observed <sup>(5)</sup>
Half life	$28.5 \pm 0.2$ years <sup>(6)</sup>
Measuring instrument	4 $\pi\beta$ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899  
January, 1991

William P. Reed, Acting Chief  
Office of Standard Reference Materials

\*Notes on back

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## NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	$16.5 \pm 0.5$ mm
wall thickness	$0.60 \pm 0.04$ mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

- (2) Solution density is  $1.014 \pm 0.002$  g/mL at 21.5 °C.

- (3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) liquid-scintillation measurements	0.01 percent
b) gravimetric measurements	0.05 percent
c) dead time	0.10 percent
d) background	0.01 percent
e) detection efficiency	0.30 percent
f) decay-scheme data	0.10 percent
g) half life	0.01 percent
h) radionuclidic impurities	0.10 percent

- (4) The limit of detection for photon-emitting impurities is:

$$0.01 \text{ } \gamma \text{ s}^{-1} \text{ g}^{-1} \text{ between } 50 \text{ and } 1900 \text{ keV.}$$

- (5) The limit of detection for alpha-particle-emitting impurities is:

$$0.05 \text{ } \alpha \text{ s}^{-1} \text{ g}^{-1}.$$

- (6) NCRP Report No. 58, 2nd Edition, February 1983, p. 363.

For further information please contact Dr. Larry Lucas at (301) 975-5546.

4919-G

000024

**NOTES ON THE USE  
OF  
STANDARD REFERENCE MATERIAL 4919G, STRONTIUM-90**

The activity of the strontium-90 in the ampoule is given per gram of solution. If transfers are made by volume, the density given on the certificate can be used to compute the activity per unit volume. The activity given is the strontium-90 activity only. Because the strontium-90 is in equilibrium with its yttrium-90 daughter, which is also a beta-particle emitter, the activity given should be doubled to get the corresponding total beta-particle-emission rate.

If the solution is to be used for making quantitative sources, it should be kept tightly sealed so that evaporation, and the consequent change in the radioactivity concentration, is minimized. Glass containers are best for storage.

Dilute solutions of strontium-90 are often assayed by liquid-scintillation counting. We recommend that a carrier solution containing approximately 1 mg of non-radioactive strontium be added first to the liquid-scintillation cocktail. We typically use a carrier solution containing 4 mg of strontium in 10 mL of 0.5-molar hydrochloric acid. When 0.25 mL of this solution is added to 10 mL of emulsion-type liquid-scintillation cocktail, the resulting 1 mg of strontium per vial is generally sufficient to prevent the radioactive strontium-90 from plating out on the vial walls. A set of liquid-scintillation vials that cover a range of sample-solution masses should be prepared and monitored over several days to ensure that the efficiency is constant.

The beta-particle counting efficiency will be somewhat less than unity. A correction for the loss of low-energy beta particles can be computed using the integral-discriminator-extrapolation technique (G. Goldstein, *Nucleonics* 23 (1965) 67) or using the liquid-scintillation efficiency-tracing technique with tritium (B.M. Coursey et al, *Int. J. Radiat. Isotopes* 37 (1986) 403).

The activity concentration given on the certificate is as of 1200 hours Eastern Standard Time, August 9, 1990. To convert from EST to your local time, the table given below can be used.

**TO CONVERT FROM EST TO:**

<b>EDT</b>	<b>Add</b>	<b>1 hour</b>
<b>CDT</b>	<b>Same as EST</b>	
<b>CST</b>	<b>Subtract</b>	<b>1 hour</b>
<b>MDT</b>	<b>Subtract</b>	<b>1 hour</b>
<b>MST</b>	<b>Subtract</b>	<b>2 hours</b>
<b>PDT</b>	<b>Subtract</b>	<b>2 hours</b>
<b>PST</b>	<b>Subtract</b>	<b>3 hours</b>
<b>UTC</b>	<b>Add</b>	<b>5 hours</b>



PROJECT \_\_\_\_\_

Sr-90 LCS

## SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

### Dilution Source Information

Isotope: \_\_\_\_\_

Sr-90

Parent Barcode Number \_\_\_\_\_

AA0046

Vendor or Certificate I.D. # of Parent Standard: \_\_\_\_\_

-

Diluted Source Logbook I.D. #:

91-0225-30-2

Balance Verification?: \_\_\_\_\_

y

Diluent Used: \_\_\_\_\_

1.0 M HCl

### Dilution

\*Diluent: \_\_\_\_\_

1 M HCl

\*Density of diluent (g/ml): \_\_\_\_\_

1.0121

g/ml

a: Parent Specific Activity: \_\_\_\_\_

6000.69 pCi/ml - pCi/g 8/1/90

b: Amount of Source Transferred: \_\_\_\_\_

2.00 2.01

g

c: Total amount of Dilution: \_\_\_\_\_

303.63

g

d: Total Volume of Dilution: \_\_\_\_\_

300.0

ml

e: Activity of Dilution (a \* b / c): \_\_\_\_\_

40.49

pCi/g

8/1/90

f: Activity of Dilution (a \* b / d): \_\_\_\_\_

40.50

pCi/ml

Dilution Logbook I.D. #:

95-0721-33-1

Prepared By: \_\_\_\_\_

G.C. M. L.

Preparation Date: \_\_\_\_\_

7/9/96

Reviewed By: \_\_\_\_\_

M. H. B.

Review Date: \_\_\_\_\_

7/9/96

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By \_\_\_\_\_

000026

Signed \_\_\_\_\_

Date \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_

CERT #	Calibration	Expiration	Reference	VENDOR	PREP	WITNES
Parent Rad#	CERT date	Date	#		INITIALS	INITIALS
SRM #	1000	10-2-93	SRM #4919-6-A	NIST		
4919-6	AUG 1, 1990		91-0199-63			
ITEM #	Preparation	Final	INITIAL			
	DATE	Concentration	Concentration			
✓	10-2-91 1000 EST AUG 1, 1990	6000.685 $\mu\text{Ci/g}$	4.514 $\times 10^3 \text{ Bq/g}$			

9/10/91

Radioisotope = SR-90

SOURCE # 4919-6

SOURCE description# Solution in NIST Borosilicate glass ampule

Composition # SR-90 + Y-90 plus approximately 95 mg of non radioactive SR and yttrium per gram of 1 molar HCL

mass

Radioactivity conc

Reference time =

T<sub>1/2</sub> =

approximately 5.0 grams  
4.514  $\times 10^3 \text{ Bq/g}$   
1000 EST Aug. 1, 1990  
28.5 to 2 years

10/2/91 Preparation

// weighing

100.0 ml V.F. + standard of SR-90 in ampule

= 65.2000

100.0 ml V.F. (empty) (g) = 60.2814

DIFFERENCE or mass (g) t.w. = 4.9186

2/ calculations =

$$4.514 \times 10^3 \text{ Bq/g} \times 4.9186 = 22,202.5604 \text{ Bq}$$

$$22,202.5604 \text{ Bq} \times 0.7027 \text{ Bq/Bq} = 6000.685979 \text{ Bq}$$

(STD date Aug 1, 1990) Continued on Page

Transferred 11-19-91 Paul Felt

(Received from LAL 106 0199 pg 63)  
Read and Understood By

000027

for  
Signature

11/19/91  
Date

for  
Signature

12/4/91  
Date

Kearney/Centaur Division  
A.T. Kearney, Inc.  
2952 George Washington Way  
Richland, Washington 99352  
509 375 5667  
Facsimile 509 375 5151

Management  
Consultants



**ATKEARNEY**

28 August 1996

Ms. Joan Kessner  
Bechtel Hanford Incorporated  
3350 George Washington Way MSIN BI-35  
Richland, Washington 99352

Dear Ms. Kessner:

Enclosed is the radiochemistry data validation report for sample data group LK7418-LAS.

Sincerely,

R. Bruce Christian, CIH  
Associate

cc: J. Duncan - CH2  
J. Goode - ATK

Date: 28 August 1996  
To: Bechtel Hanford, Inc. (technical representative)  
From: A.T. Kearney, Inc.  
Project: 100-NR-2 Performance Monitoring Round 0 - July Samples  
Subject: Radiochemistry - Data Package No. LK7418-LAS (SDG No. LK7418)

## **INTRODUCTION**

This memo presents the results of data validation on Summary Data Package No. LK7418-LAS which was prepared by Lockheed Analytical Services (LAS). A list of samples validated along with the analyses reported and the requested analyte is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOHXQ8	07/10/96	Water	C	Strontium-89,90

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1992b). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

## **DATA QUALITY OBJECTIVES**

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analyses is six months.

All holding times were acceptable.

- **Instrument Calibration and Performance**

Instrument calibration is performed to establish that the counters used to determine radionuclide activities are capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument

000001

efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

Initial and continuing calibrations are not reviewed under Level C validation.

- **Blanks**

- Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the MDA, the following qualifiers are applied: All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"; sample results below the MDA are elevated to the MDA and qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

All blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water or field samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

All accuracy results were acceptable.

- **Precision**

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal

to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All precision results were acceptable.

#### Field Split Samples

One pair of field split samples were submitted to QES/LAS for analysis as shown below:

<u>Sample No.</u>	<u>Split Sample No.</u>	<u>Well No.</u>
BOHXP8 (QES)	BOHXQ9 (LAS)	199-N-92A

The split sample results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. All split sample results were within QC limits.

- **Detection Levels**

Reported laboratory detection levels are reviewed to ensure that they are at or below the CRDL. All reported MDAs were at or below the analyte specific CRDL.

- **Completeness**

Data Package No. LK7418-LAS (SDG No. LK7418) was submitted for validation and verified for completeness. The completion rate was 100%.

#### MAJOR DEFICIENCIES

None found.

#### MINOR DEFICIENCIES

None found.

## REFERENCES

- EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.
- EPA, 1988a, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1991, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, Environmental Protection Agency, Washington, D.C.
- WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.
- WHC, 1992b, *Data Validation Procedure for Radiological Analyses*, WHC-SD-EN-SPP-001, Rev. 2, Westinghouse Hanford Company, 1993.
- EPA, 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. Environmental Protection Agency, Washington, D.C.
- WHC, 1994, *Validation Statement of Work*, Rev.1, Westinghouse Hanford Company, 1994.

**Appendix 1**  
**Glossary of Data Reporting Qualifiers**



Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.

**Appendix 2**  
**Summary of Data Qualification**

# DATA QUALIFICATION SUMMARY

SDG: LK7418	REVIEWER: RBC	DATE: 08/28/96	PAGE <u>1</u> OF <u>1</u>
COMMENTS: No qualifiers assigned.			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

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### **Appendix 3**

#### **Qualified Data Summary and Annotated Laboratory Reports**

[illegible]

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# LOCKHEED ANALYTICAL SERVICES

## RADIOCHEMISTRY DATA REPORT

Account Name: Bechtel Hanford, Inc. \* Richland, WA

Project Name: BECHTEL-HANFORD

Project Desc: Bechtel Hanford Project

Client Sample ID: BOHXQ8

Date Collected: 10-JUL-96

Matrix: Water

Login Number: L7418

Date Received: 13-JUL-96

Constituent	Method	Batch	Activity	From	MOA	Qualifier	Units	Analyzed	Lab ID
Sr-89,90	LAL-0065	38962	0.28	0.68	1.2		pCi/L	19-JUL-96	L7418-2 U

RBC  
8/28/96

## **Appendix 4**

### **Laboratory Narrative and Chain-of-Custody Documentation**

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LOCKHEED MARTIN

July 23, 1996

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
3350 George Washington Way  
MS B1-35  
Richland, WA 99352

RE: Log-in No.: L7418  
Quotation No.: Q400000-B  
SAF: B96-147  
Document File No.: 0713596A  
WHC Document Control No.: 386  
SDG No.: LK7418



The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on July 13, 1996. The temperature of the cooler upon receipt was 5°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen M. Hall at (509) 375-4741.

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Sincerely,

*Karen Herman* for  
Kathleen M. Hall  
Client Services Representative

cc: Client Services  
Document Control

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**CASE NARRATIVE  
RADIOCHEMICAL ANALYSES**

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, and duplicate samples.

NOTE: Chemical recoveries and minimum detectable activities can be found on the preparation sheets and calculation sheets of the attached raw data.

**Holding Time Requirements**

All holding time requirements were met.

**Analytical Method Strontium-90**

The strontium-90 analysis was performed using standard operating procedure, LAL-91-SOP-0065. The samples were analyzed in workgroup 38962. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample recovery was within QC criteria. The duplicate recoveries were within QC criteria. The minimum detectable activity for sample BOHXQ8 (L7418-2) was greater than the reporting detection limit; since all QC criteria were met data quality is not believed to be adversely affected. No re-analyses were performed.

Andrea Tippet  
Prepared By

June 23, 1996  
Date

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Bechtel Hanford Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L7418

B96-147-19

Page 1 of 1

Data Turnaround

- ☐ Priority  
☐ Normal

Collector A. Rizzo		Company Contact J. V. Borghese		Telephone No. (509) 373-4790		
Project Designation 100-NR-2 Pump and Treat Treatability Study		Sampling Location 100 N		SAF No. B96-147		
Ice Chest No. GWS-025		Field Logbook No. EX-1288		Method of Shipment Federal Express		
Shipped To Lockheed		Offsite Property No. W96-0-0314-2		Bill of Lading/Air Bill No. 2904659773		
POSSIBLE SAMPLE HAZARDS/REMARKS		Preservation	HNO3 to pH < 4	None		
		Type of Container	G/P	G/P		
		No. of Container(s)	4	1		
Special Handling and/or Storage Maintain samples between 2 degrees C and 6 degrees C.		Volume	1000ml	20ml		
SAMPLE ANALYSIS			Strontium-89,90 - Total Sr	Activity Scan		
Sample No.	Matrix *	Sample Date	Sample Time			
BOHXQ8	Water	7/10/96	0930	X	X	
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS		
Relinquished By A.G. Rizzo (Eds)		Date/Time 7-10-96		Relinquished By Vic White		
Relinquished By Vic White		Date/Time 7-10-96		Relinquished By Vic White		
Relinquished By		Date/Time		Relinquished By		
Relinquished By		Date/Time		Relinquished By		
Relinquished By		Date/Time		Relinquished By		
Relinquished By		Date/Time		Relinquished By		
LABORATORY SECTION		Received By Paul C. [Signature]		Title Sample Custodian		
		Date/Time 7-13-96		Date/Time 7-13-96		
		Disposed By		Date/Time		

- Matrix \*
- S - Soil
  - SE - Sediment
  - SO - Solid
  - SL - Sludge
  - W - Water
  - O - Oil
  - A - Air
  - DS - Drum Solids
  - DL - Drum Liquids
  - T - Tissue
  - WI - Wipe
  - L - Liquid
  - V - Vegetation
  - X - Other

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**Appendix 5**  
**Data Validation Supporting Documentation**

## RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT: 100NR2 July			DATA PACKAGE: LK7418		
VALIDATOR: RK		LAB: LAS		DATE: 27 Aug 96	
CASE:			SDG: LK7418		
ANALYSES PERFORMED					
<input type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input type="checkbox"/> Technetium-99	<input type="checkbox"/> Alpha Spectroscopy	<input type="checkbox"/> Gamma Spectroscopy	
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input type="checkbox"/> Tritium	<input type="checkbox"/>		
SAMPLES/MATRIX water					
B0HXQ8					

1. Completeness . . . . . ☐ N/A

Technical verification forms present? . . . . . Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. Initial Calibration . . . . . ☒ N/A

Instruments/detectors calibrated within  
one year of sample analysis? . . . . . Yes No N/A

Initial calibration acceptable? . . . . . Yes No N/A

Standards NIST traceable? . . . . . Yes No N/A

Standards Expired? . . . . . Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

A-1

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3. Continuing Calibration . . . . . ☒ N/A

Calibration checked within one week of sample analysis? . . . Yes No N/A

Calibration check acceptable? . . . . . Yes No N/A

Calibration check standards NIST traceable? . . . . . Yes No N/A

Calibration check standards expired? . . . . . Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. Blanks . . . . . ☐ N/A

Method blank analyzed? . . . . . Yes No N/A

Method blank results acceptable? . . . . . Yes No N/A

Analytes detected in method blank? . . . . . Yes No N/A

Field blank(s) analyzed? . . . . . Yes No N/A

Field blank results acceptable? . . . . . Yes No N/A

Analytes detected in field blank(s)? . . . . . Yes No N/A

Transcription/Calculation Errors? . . . . . Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Matrix Spikes . . . . . ☒ N/A

Matrix spike analyzed? . . . . . Yes No N/A

Spike recoveries acceptable? . . . . . Yes No N/A

Spike source traceable? . . . . . Yes No N/A

Spike source expired? . . . . . Yes No N/A

Transcription/Calculation Errors? . . . . . Yes No N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*A-2/r*

6. Laboratory Control Samples . . . . . ☐ N/A

LCS analyzed? . . . . . ☒ Yes No N/A

LCS recoveries acceptable? . . . . . ☒ Yes No N/A

LCS traceable? . . . . . Yes No ☒ N/A

Transcription/Calculation Errors? . . . . . Yes No ☒ N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. Chemical Recovery . . . . . ☐ N/A

Chemical carrier added? . . . . . ☒ Yes No N/A

Chemical recovery acceptable? . . . . . ☒ Yes No N/A

Chemical carrier traceable? . . . . . Yes No ☒ N/A

Chemical carrier expired? . . . . . Yes No ☒ N/A

Transcription/Calculation errors? . . . . . Yes No ☒ N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Duplicates . . . . . ☐ N/A

Duplicates Analyzed? . . . . . ☒ Yes No N/A

RPD Values Acceptable? . . . . . ☒ Yes No N/A

Transcription/Calculation Errors? . . . . . Yes No ☒ N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4.3

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9. Field QC Samples . . . . . ☐ N/AField duplicate sample(s) analyzed? . . . . . Yes ☒ No ☐ N/AField duplicate RPD values acceptable? . . . . . Yes ☐ No ☒ N/AField split sample(s) analyzed? . . . . . ☒ Yes ☐ No ☐ N/AField split RPD values acceptable? . . . . . ☒ Yes ☐ No ☐ N/APerformance audit sample(s) analyzed? . . . . . Yes ☐ No ☒ N/APerformance audit sample results acceptable? . . . . . Yes ☐ No ☒ N/AComments: Split of BOTH XPS - Both undetected

## 10. Holding Times

Are sample holding times acceptable? . . . . . ☒ Yes ☐ No ☐ N/A

Comments: \_\_\_\_\_

11. Results and Detection Limits (Levels D & E) . . . . . ☐ N/AResults reported for all required sample analyses? . . . . . ☒ Yes ☐ No ☐ N/AResults supported in raw data? . . . . . ☒ Yes ☐ No ☒ N/AResults Acceptable? . . . . . ☒ Yes ☐ No ☐ N/ATranscription/Calculation errors? . . . . . ☒ Yes ☐ No ☒ N/AMDA's meet required detection limits? . . . . . ☒ Yes ☐ No ☐ N/ATranscription/calculation errors? . . . . . ☒ Yes ☐ No ☒ N/A

Comments: \_\_\_\_\_

AA/

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